# To strip or not to strip the incompetent saphenous vein

## Chapter 12: General Discussion and summary

For this thesis a group of 532 legs of consecutive patients presenting with varicose veins of the lower extremities at the Surgical outpatient department of the Maastricht University Hospital was investigated to assess the value of certain non-invasive tests in the diagnosis of superficial venous valvular incompetence. This same group of legs was used to study the symptoms and signs of varicose veins and their relation to haemodynamic findings. The subgroup of patient's legs diagnosed as having an isolated insufficiency of the greater saphenous vein was allocated to two different treatment forms. The treatment forms compared were stripping of the entire saphenous vein and high ligation of the sapheno-femoral junction combined with sclerotherapy. During a three year follow-up the effect of both treatment modalities on complaints, cosmetics and non-invasive hemodynamic parameters was followed.

Varicose veins were recognised by the ancient Egyptians. Treatment was primarily by the knife until the introduction of the hypodermic syringe in 1845. From then on there were two camps, in one varicosities were treated entirely by surgery, in the other entirely by sclerotherapy. The relations between the camps were difficult and rare[1] (Chapter 1).

While the anatomy of the greater saphenous system is fairly constant and knows little variation, the location of the sapheno-popliteall junction definitely is not. The sapheno-popliteall junction is not always situated in the middle of the popliteal fossa, but can be located at any point proximal to the fossa, while sometimes there is a total absence of the junction. Because of this variation adequate surgery can only be carried out if the exact location of the junction has been determined pre-operatively (Chapter 2).

The calf muscle pump is sometimes termed "second heart" of the circula-

tion. The function of this "heart" can be jeopardised by an ineffective circular motion of blood as in primary varicose veins. This can lead to functional decompensation of the venous system resulting in a chronic venous insufficiency. The pathway of circular motion can be junctional but also non-junctional through incompetent communicating veins located from mid-thigh to ankle.
The theory of descending venous valvular incompetence in the development of varicose veins has been replaced by the concept that vessel wall weakness, probably hereditary of origin, is the real cause of the development of varicose veins (Chapter 3)

In the Western population the prevalence figures for varicose veins are near to the prevalence figures for diabetes and stomach ulcers. Recent studies concerning the etiology of varicose veins have demonstrated that age is the only and single factor which correlates to the development of varicose veins. Factors such as childbirth, bodyweight, bowel habit and even the wearing of corsetry, seemed significant because of the higher age of the inspected population. After correction for age these factors appear to play no role in the development of varicose veins of the legs. Varicose veins of the lower extremities are a socio-economic problem of considerable magnitude as demonstrated by the Basle study[2] which differentiates between venous "disorder" (superficial varicosis with no main stem insufficiency) and venous "disease" (reticular veins or hyphen webs combined with stem insufficiency). Ninety percent of the patients with venous "disease" seek medical care and 13% undergo loss of work because of the disease, compared to 36% and 3.4% respectively in the venous "disorder" group (Chapter 4).

Many physicians still believe that the majority of patients with "straightforward" varicose veins require nothing more than a full history and a careful physical examination. However clinical criteria alone as rationale for operation are not sufficient[3]. A Doppler examination, or if available a duplex investigation, is necessary to determine whether varicose veins

are primary or secondary and to judge the patency of the deep venous system. Exact investigation and localisation of escape points of venous reflux, whether junctional or non-junctional,will determine the mode of treatment and is only possible with ultrasound techniques (Chapter 5).
Varicose veins are probably the most common as well as the worst treated disorder presented to the general surgeons[4] (Chapter 6). Dormandy described venous disease as the Cinderella among the circulatory disorders[5]. Despite the development of short stay or out-patient surgery, varicose patients constitute a considerable part of surgical waiting lists.

There could be a place for simpler and less expensive methods than surgery, provided these methods were as effective as surgery. The cost of compression-sclerotherapy (CST) is about 15% of the cost of surgical correction, but what are the costs of recurrence requiring later redo surgery? The reports by Hobbs[6] and Jakobsen[7] indicate that approximately 20% of patients who are eligible for surgery in an unselected population may be equally well treated by CST. Geographical differences seem to play an important role in treatment choice. In some countries such as France and Switzerland, sclerotherapy is still the preferred method of treatment. In the Scandinavian countries surgery is the method of first choice, whilst in America long and short saphenous veins are stripped indiscriminately and all varicose tributaries are treated by excision through multiple incisions; injection sclerotherapy is hardly accepted[8]. However various controlled trials establish a place for sclerotherapy. Chant (1972) in a randomised study found no significant differences three years after surgery compared to compression sclerotherapy, although re-treated patients were included in the results and various forms of varicosis were treated[9]. Doran (1975) found one year results in favour of CST (24% failures) over surgery (44% failures) but at two years the difference had disappeared (21% versus 16%)[10].

Three prospective randomised trials with long term follow-up comparing

surgery with compression sclerotherapy are available. Hobbs (1968) found two years results of sclerotherapy favourable compared to surgical results.

In 1974 however he reported that the one year cure rate of 82% in the CST group had fallen to a mere 7% at five years, and only 30% were still improved. In contrast 20% of the surgical group remained cured and 80% improved at five years[6]. He concluded that patients with sapheno-femoral incompetence were best treated by surgery. Evaluation of treatment results was made both objectively and subjectively. Hamilton Jacobsen's study with a three year follow-up included only incompetent greater saphenous veins[7]. Three treatment modalities were applied: surgery, CST and a combination of CST with minor surgery. A somewhat better objective immediate result was found after surgery than after CST, but there was a fall in cure rate with both methods used. The failure rate after surgery however was very low and the cure rate in the long term was better than after CST. Combining CST with minor surgery (resection of incompetent communicating veins or ligation of the sapheno-femoral junction) gave results better than CST alone but not as good as surgery. Einarson performed foot volumetric measurements to support the clinical evaluation of results. He found that throughout the follow-up the patients operated upon had a better venous function than those treated by CST alone, and a group treated by CST combined with minor surgery revealed foot volumetric test results in between those of the CST group and the surgically treated group[8]. This indicates that surgical interruption of at least the sapheno-femoral junction is important in the treatment of sapheno-femoral incompetence. Munn (1981) demonstrated in a randomised trial that the results of treatment as judged by patients were biased against stripping because of the high incidence of paraesthesia in the stripped limbs, although results of treatment judged purely by the recurrence of varicosities at follow-up were significantly better in the limbs from which the saphenous vein had been stripped compared to the results after high ligation without stripping[11]. Clearly nerve damage is unacceptable to patients as part of an operation for

purely cosmetic purposes. Hammarsten (1990) compared results of terminal branch ligation, perforating vein ligation and standard stripping of the greater saphenous vein to terminal saphenous branch ligation, ligation of perforating veins and ligation of the sapheno-femoral junction without stripping[12]. Treatment evaluation was by means of plethysmography. Excellent or good results were obtained in 88% of the stripped group compared to 89% of the ligated group. Recurrent varicosities were found in 12% versus 11% respectively. Removal of the saphenous vein is apparently of no therapeutic value if all perforating veins to the deep veins have been ligated. Selective stripping limited to segments with Doppler demonstration of reflux compared excellent to complete stripping in patients in whom reverse flow was demonstrated in the saphenous trunk[13]. When there is incompetence of proximal long or short saphenous vein (which is present in more than 6% of primary varicose veins) surgery is the method of choice because injection alone cannot produce long term success, since compression cannot be maintained at the upper thigh, groin or popliteal fossa. Sclerotherapy alone of the greater saphenous vein in the presence of sapheno-femoral junctional or greater saphenous vein stem reflux is unlikely to remain successful in the long term. These patients require control of the refluxing junction prior to sclerotherapy.
Obliteration of the greater saphenous vein after sclerotherapy was found by means of colour duplex scanning in only 6% below a refluxing junction and in 40% below a non refluxing junction[14].

The new understanding of venous haemodynamics has led to altered concepts of treatment. With the use of duplex ultrasonography patterns of reflux can be exactly mapped[15]. In this way it was demonstrated that isolated main trunk insufficiency is far less frequent than branch insufficiency. Also the assumption of the sapheno-femoral escape as the sole source of reflux into the saphenous system now seems incorrect. Recently in only 64% of truncal varicosities escape points were found to be localised at the sapheno-femoral junction. In the remainder proximal

escapes were localised elsewhere and non-junctional[15]. Twenty percent of the legs have a combined deep, communicating and superficial vein incompetence. In the absence of a specific incompetent communicating vein, feeding a superficial varicosity, routine perforator ligation without regard to it's incompetence seems unwarranted. A surprising amount of deep reflux was found in legs with no prior evidence of thrombotic disease. This might be an extra support to the theory of venous recirculation which determines the surgical management of truncal varicosis. Venous recirculation causes secondary popliteal or femoral vein insufficiency because the increase in dynamic vein pressure leads to functional decompensation of the deep venous system[16]. These data support the heterogenicity of venous disease in patients with varicose veins and suggest that surgical therapy be directed to the patients specific pattern of incompetence rather than routine sapheno-femoral junction ligation or stripping of the greater saphenous trunk.

The relation between symptoms and signs at clinical investigation and the various forms of superficial venous valvular incompetence was investigated (Chapter 7). Using a complaint severity score constituted from the three most common symptoms pain, cramps and swelling it is possible to differentiate between superficial varicosis with and without main branch involvement. But the standard deviation is so large that this finding has no clinical relevance. When there is main branch involvement a further differentiation into the nature of the insufficient branch is not possible by means of symptoms and signs.

In chapter 8 the value of photoplethysmography in the diagnosis of superficial venous valvular incompetence of the lower limbs was compared to clinical investigation combined with Doppler ultrasound testing in 533 limbs of a consecutive group of 268 patients. The main problem encountered was the unacceptably high number of uninterpretable PPG registrations which makes it's use in the routine evaluation of superficial venous valvular incompetence problematic. Attempts to diminish the

uninterpretable results proved fruitless. Comparison with literature reveals that this problem has been encountered by other authors.
Favourable results with PPG by others were only obtained after averaging the outcome of repeated investigations on one limb and leaving out divergent values. Introduction of additional criteria in our study such as the half venous refill time and the calculated venous refill time gave an even higher percentage of non-interpretable PPG registrations. Excluding the non-interpretable PPG results, the Kappa value as measure of agreement between PPG and clinical investigation combined with Doppler was as low as 0.30. Explanations for the poor PPG results are the sensitivity of the device for surrounding illumination, skin reflection, skin and room temperature, skin pigmentation, haematocrit and pressure with which the transducer is fixed to the skin. Furthermore PPG recovery times probably reflect regional haemodynamics rather than overall venous hemodynamics in the limb. Our results are confirmed by recent investigations in which it was found that photoplethysmography has the same value to predict the presence of multilevel reflux as inspection of the skin in the gaiter area[17]. From our results we conclude that PPG is not the method of choice in the routine evaluation of superficial venous valvular incompetence. It's continued use is not warranted, although it is still used for this purpose in many vascular laboratories.

The treatment of varicose veins has an enormous impact on the costs of public health. This results in a tendency to turn to high saphenous ligation and sclerotherapy as an attractive out-patient alternative to hospital admission for operative treatment. In order to compare the symptomatic, cosmetic and haemodynamic results of treatment of isolated valvular incompetence of the greater saphenous vein by classical stripping from ankle to groin to high ligation combined with sclerotherapy this study was undertaken (Chapter 9).

In order to objectively study the effect of both treatments on local haemodynamics standard, non-invasive tests were used during the

follow-up. A total of 181 patient legs were randomised to either of both treatment modalities. After three years of follow-up, significant differences were found in favour of classical stripping both with regard to patient's and surgeon's evaluation of cosmetic results and with regard to clinical and Doppler ultrasonic evidence of reflux in the greater saphenous vein. No statistically significant differences could be found between the two groups regarding residual or persisting complaints at any follow-up moment. The reasons for the differences found between the two groups are explained in two ways. First general anaesthesia, as used in the stripping group, permits a more radical ligation of the sapheno-femoral junction and the groin tributaries. Secondly, stripping eliminates the thigh communicating veins, which are an important source of non-junctional reflux. High ligation eliminates only the sapheno-femoral junction as source of reflux. At the time this study was started, stripping from ankle to groin was the standard surgical treatment option in our clinic. If a study like this would now be initiated, classical stripping would surelely be replaced by "selective stripping" from just below the knee to the groin. The three year results of both treatment modalities can be considered disappointing when looking at the percentages of good results. This is not confirmed by the patient's appraisal of therapy, which as a whole is quite satisfactory. This underlines that evaluation of therapy by subjective judgement by patients alone is insufficient to determine the value of different treatment modalities for varicose veins.

Confronted with an unacceptable high incidence of damage to the saphenous nerve after stripping from ankle to groin, an in vivo anatomic study was undertaken (Chapter 10). Aim of the study was to locate a level at which damage to the saphenous nerve could be kept to a minimum while stripping the main trunk of the saphenous vein. Seventy-five patient legs in which the saphenous vein was harvested for coronary artery bypass procedures were investigated. In almost al cases the nerve was completely adherent to the saphenous vein in the lower part of the leg. In the majority of cases a bifurcation of the nerve was found in

between the distal third and halfway the tibia. During the stripping procedure the stripper head has to pass under this bifurcation, usually causing avulsion of the side branch. Five cm. distal to the knee joint the saphenous nerve was adherent to the vein in only 6% of the cases. We believe selective stripping down to this point will reduce damage to the saphenous nerve without compromising the symptomatic and functional success of the operation.